

2020
STUDENT RESEARCH SYMPOSIUM



► Featured Art: "Bison" by Jasper Kipp '20

TUESDAY, APRIL 28



To the Coe College community,

Welcome to the 20th annual Coe College Student Research Symposium!

As a liberal arts college with a dedication to our students and their work, we remain committed to giving our students this opportunity to research, create and present. And so, as part of the Coe College response to COVID-19, we have moved the 2020 Student Research Symposium online.

This day is set aside to celebrate the work of our undergraduate scholars in all areas of study. Whether the presentation highlights the creative energy captured in a novel or the in-depth laboratory study of the nature of matter, student work shared today is at the heart of the academic enterprise at Coe. Extending learning and teaching beyond the classroom through close interactions between students and faculty members, even from a distance, is one of the highlights of a Coe education, and we encourage you to take advantage of the opportunity to learn about our students' work. Our students have devoted a great deal of time and energy toward these presentations, and having members of the college community there to support them is very meaningful.

Our traditional symposium day begins with a morning poster session in the Learning Commons, followed by a distinguished alumni speaker, lunch for students and faculty mentors and then student oral presentations in the afternoon. This year all student presentations, posters, slides, musical selections and more have been posted together on the Student Research Symposium website. There is a remarkable range of scholarship represented in the symposium, and we urge you to explore as much of it as you can.

Finally, we wish to thank everyone who has made this day possible — the students presenting their work, faculty mentors and facilitators, Kim Lanegran, Marc Falk, Laura Van Buer and Jasmine Barlow '21 in the Learning Commons for their work in organizing the symposium, and Natalie Milke and her team in marketing for making the move online possible.

Enjoy the day!

A handwritten signature in cursive script, appearing to read "Paula O'Loughlin".

Paula O'Loughlin
Provost

POSTER PRESENTATIONS

Calvin, Olivia (2022), Zach Morris (2022). Faculty Sponsor, Brittney Miller. **“Nitrate in Iowa watersheds.”**

Using mathematical modeling and statistical analysis, this research aims to discover if the amount of precipitation within a given time and location causes an increase of nitrate in the surrounding watersheds. The watersheds that Calvin and Morris analyzed were all within the vicinity of farmland. Nitrate is a highly soluble poly-atomic ion that is a key compound in many fertilizers. Its high solubility coupled with proximity to watersheds means they are all highly susceptible to fertilizer runoff. Calvin and Morris are able to investigate this relationship by gathering and analyzing data from the Iowa Department of Public Health and the Coe College Department of Chemistry.

Cartwright, Marissa (2021) Faculty Sponsors, Jesse Ellis and Carrie Kissman. **“Bythotrephes Longimanus Presence Causes Density Differences in Bosmina spp. and Daphnia spp. in Three Lakes in Northern Minnesota.”**

Invasive species like the spiny water flea (*Bythotrephes longimanus*) have been known to disrupt ecosystems by adding predation pressure to prey species like *Daphnia* spp. and *Bosmina* spp. Cartwright compared the population densities of the aforementioned prey species in lakes that were infested between 2010 and 2014. *B. longimanus* densities should be greater and prey densities smaller where they had been introduced earlier. Zooplankton tows from each lake were analyzed, finding that *Daphnia* spp. followed the expected trend, but *B. longimanus* and *Bosmina* spp. did not. Although more studies are needed, the findings provide insight for both scientists and conservationists.

Cloutier, Haylee (2021), Elizabeth Koshatka (2020), Jaelynn Smith-Harmon (2021) Faculty Sponsor, Samantha Brown. **“Self-Compassion and Self-Efficacy in First-Year Students.”**

Previous research investigated relationships between self-compassion and self-efficacy. However, limited research has been conducted with college students on the relationship between self-compassion, self-efficacy, resiliency, outcome expectations, perception of barriers and perceived stress. First-year students at a small Midwest college responded to an online questionnaire assessing the variables listed above. This study examines the correlations between these variables, as well as how they change over time (T1: N = 51 and T2: N= 18). Cloutier, Koshatka and Smith-Harmon predict higher levels of self-compassion will be related to higher levels of resiliency, self-efficacy and outcome expectations and lower perception of barriers and perceived stress.

Dodd, Cooper (2020), Janek Juarez (2020), Joslyn Reiche (2021), Kenzie Scott (2020) Faculty Sponsor, Benjamin Tallman. **“Nurses Perceptions Regarding The Use of Technology and Virtual Reality for Pain Management.”**

The purpose of this study is to gather information on health care professionals’ perceptions regarding the use of technology for evidence-based practice. Therapeutic Virtual Reality (VR) is a promising treatment intervention that has been shown to reduce pain by distracting individuals through immersive technology. While research supports the use of VR for various health conditions, there is a lack of research examining health care providers’ perceptions of using technology including VR. The poster will discuss implications for clinical practice and identify additional gaps in the research literature regarding virtual reality as a nonpharmacological intervention for pain.

Douglass, Monica (2020) Faculty Sponsor, Cassy Cozine. **“Effects of Curcumin on Inflammatory Pathways of Caenorhabditis Elegans During Heat Shock Response.”**

The objective of this research project is to assess the effect of curcumin on inflammation pathways by analyzing the transcription factors and heat shock proteins induced by heat stress in *C. elegans*.

Lyman, Holly (2021) Faculty Sponsor, Jo Ann Miller. **“Manchester Study Abroad.”**

This poster will show Lyman’s time studying abroad in Manchester, England. It was an amazing time where Lyman learned a lot about herself and traveled to all of Europe. She hopes through her poster and accompanying speech to inspire others to make the leap to study abroad.

Niday, Laura (2020) Faculty Sponsors, Paula O’Loughlin and Barb Tupper. **“United Nations Externship - February 2020.”**

Laura Niday attended UNCITRAL’s, or the United Nations Commission on International Trade Law’s, 71st session of Working Group II, which handles Expedited Arbitration and Dispute Settlement. This opportunity is hosted by Coe alum and Trustee Dr. Alan Anderson, who represents the nongovernmental organization Forum for International Conciliation and Arbitration (FICA). During this opportunity, Niday had the chance to attend a Broadway show, visit the main sights of New York and attend daily sessions at the United Nations, where she learned a lot about international expedited arbitration.

Obeng, Jacquelyn (2020) Faculty Sponsor, John Chaimov. **“A Time Around the World.”**

Showcasing Obeng’s experience and time in South Korea.

Reiche, Joslyn (2021), Janek Juarez (2020), Cooper Dodd (2020), Kenzie Scott (2020) Faculty Sponsor, Benjamin Tallman. **“Implementation of Therapeutic VR for Pain Management in a Hospital Setting.”**

This poster will show the steps taken to implement therapeutic VR for pain management in a hospital setting. The phases taken to implement this new adjunctive pain management technique were development, education and feedback, implementation and evaluation. Currently, Dr. Tallman’s research team is in phase three: implementation. Results from the education and feedback phase are still being analyzed.

Scott, Kenzie (2020), Kassie Bain (2020), Cooper Dodd (2020), Janek Juarez (2020), Joslyn Reiche (2021) Faculty Sponsor, Benjamin Tallman. **“Implementation of an Immersive Virtual Reality Pain Distraction Intervention in an Acute Care Hospital Setting.”**

The purpose of this study is to determine provider (nurse and nursing assistant) perceptions toward adopting a novel hospital-based Virtual Reality (VR) pain distraction intervention on an adult acute care hospital unit delivered by providers. Some studies have investigated the efficacy of VR in an acute care hospital setting, but few studies have addressed barriers to implementation. Because the hospital environment poses unique challenges, it is important to understand the practicality of using VR in hospitalized patients. Determining feasibility of implementation is a necessary step before pursuing more extensive, long-term evaluation of a hospital-based VR intervention on inpatient outcomes and resource utilization.

Smith, Brigette (2020) Faculty Sponsor, Ugur Akgun. **“Europium 3+ and Terbium 3+ doped Gadolinium Boro-Tungstate glasses for X-ray detectors.”**

High density scintillating glasses have a strong potential to be useful in X-ray detectors for medical imaging. In this study, known glasses composed of $X \text{ Gd}_2\text{O}_3 + Y \text{ WO}_3 + (1-X-Y) 2\text{H}_3\text{BO}_3$ where if $X = .25$ then $Y = .25, .35, .45$ and if $X = .20$ then $Y = .20$ were doped with between 0-6% Europium or Terbium and prepared using a conventional melt-quench technique. Densities of these glasses ranged from 4.6 to 6.2 g/cm³. Raman studies show the presence of Eu^{3+} and Tb^{3+} cause a change in the network structure and an increase in the formation of tungsten tetrahedra within the glass. Photoluminescence studies showed the concentration of the scintillators in the glass had an effect on the ratio of intensity of luminescence bands within the spectra, but no bands showed evidence of forming or disappearing.

Sohm, Nick (2020), Janek Juarez (2020), Xinyue-Li (2020), Jordan Arneson (2020) Faculty Sponsor, Samantha Brown. **“Self-Compassion and Self-Efficacy in Undergraduate Student's Resilience and Perceived Stress.”**

Students in post-secondary education face unique challenges that can result in negative perceptions of continued education. Much of the literature hasn't looked at the relationship between self-compassion, self-efficacy and resilience in American college undergraduates. Coe College students staying on campus the summer of 2019 completed measures of all variables online (self-resilience, self-efficacy, perceived stress, anxiety and depression.) Our results indicated that individuals with self-compassion had a significant positive relationship with resilience and a negative relationship with perceived stress. Self-efficacy displayed a positive relationship with resilience and a negative relationship with perceived stress.

Stills, Robert (2021) Carlyn Cole (2020) Faculty Sponsor, Samantha Brown. **“Vocational and Professional Development through the Psychology Curriculum.”**

Previous research has studied the effectiveness of career development courses for psychology students. This study, unlike previous research, used Social Cognitive Career Theory as a guiding framework. Students (n=39) at a small Midwest liberal arts college took a pre and post-survey at the beginning and end of the course. The survey assessed career decision self-efficacy (CDSE), vocational outcome expectations (VOE) and perception of barriers (POB). Increased CDSE, VOE and decreased POB support students' vocational and educational success. Stills and Cole hypothesized CDSE and VOE will increase and POB will decrease. Results will be discussed within the context of theory.

DISTINGUISHED ALUMNI SPEAKER

Our distinguished alumni speaker for 2020 was to have been Ben Franta '09. We hope to have Ben back to campus for the 2021 symposium.

Ben Franta is a 2009 graduate of Coe, where he double majored in physics and math and participated in a range of activities including choir, theater, cross-country running and study abroad. After graduation, he obtained a master's degree in archeological science from the University of Oxford and carried out fieldwork in Iceland and Greece. He then moved to Harvard University for a doctorate in applied physics, where he worked on developing solar energy technology. While at Harvard he became active in climate change activism, helping to organize the movement for fossil fuel divestment, which became the fastest-growing movement of its kind in history. His experience in activism introduced him to a variety of leaders, provided lessons in social change and even landed him briefly in jail. He also carried out policy work at the Harvard Kennedy School of Government and lived in the Philippines to study storms and disasters driven by climate change.

Motivated to address climate change regardless of disciplinary field, after finishing his doctorate in applied physics he moved to Stanford University to carry out a Juris Doctor in law and another doctorate in history. Currently he studies the history of climate science, fossil fuel companies and climate denial and delay, and he advises legal efforts to hold fossil fuel producers accountable for climate damages. His work has appeared in peer-reviewed journals including *Nature Climate Change*, *Law & Policy* and *International Materials Reviews*, in popular platforms such as *The Guardian*, *The Nation* and *Project Syndicate*, has been cited in the U.S. Congressional Record and translated into 10 languages.

PRESENTATIONS

Session A: Natural and Mathematical Sciences

Alvarado, Kyle (2020), Luke Smailes (2021) Faculty Sponsor, Ryan Baranowski. **“Stuff vs. Control.”**

This paper uses a generalized additive model to measure the trade-off between location and velocity for MLB fastballs. With this model we can determine how accurate a pitcher must be to achieve a given run value based upon their fastball velocity. Alvarado and Smailes saw that pitches thrown harder tend to have lower xwOBA values for a given location as fastballs with lower velocities. What this means is that in order for a slower throwing pitcher to achieve a certain xwOBA value, they need to be more precise with their pitches in comparison to their harder throwing counterparts.

Appler, Matthew (2021) Faculty Sponsor, Stephen Hughes. **“Autonomous Blind Robotic Mapping.”**

Clearly, it is possible for a single explorer to systematically visit all accessible spaces in a given environment. However, variability in an unknown environment's size and complexity make it difficult to understand the optimal approach. The problem becomes more interesting when allowed the possibility of multiple agents conducting the exploration. This work set out to explore the issues associated with mapping an unknown environment using singular and teams of robotic explorers.

Copeland, Hadley (2020) Faculty Sponsor, Harlo Hadow. **“Blue-Spotted Salamander (*Ambystoma laterale*) Breeding Habits and Water Quality at Behrens Ponds and Woodlands.”**

Blue-spotted salamanders (*Ambystoma laterale*) are small black- and blue-colored salamanders that reside exclusively in forests, near ephemeral ponds where soils are sandy to allow for burrowing. In Iowa, they have only been found in two locations, leading to them being considered endangered in the state. Although they are doing quite well in these locations, rehabilitating portions of the population has become increasingly crucial due to erosion of their environment and threats from flooding near these areas. Due to the unsuccessful attempts of breeding programs, more background on this species and their environment is needed. With investigation into water quality and environmental analysis, there is hope that this project may succeed in the future.

Welch, Rebecca (2020) Faculty Sponsor, Steve Feller. “A New Structural Model for Alkali Germanate Glasses Using Statistical Mechanics.”

Similar to the boron anomaly, alkali germanate glasses also exhibit a nonmonotonic trend in coordination, which has a significant impact on the scaling of properties such as T_g , fragility and elastic modulus. Several conflicting models have been proposed due to the inability of current NMR systems to determine specific coordination environments of these glasses. As an alternative, the statistical mechanics model has been shown to accurately determine glass structural units and was applied to the alkali germanate glass system. From Welch’s work, a new structural model for this glass system is proposed and shows significant agreement in the prediction of thermal and mechanical properties.

Welch, Rebecca (2020) Faculty Sponsor, Mario Affatigato. “Creating Durable Chalcogenide Glasses with Controlled Crystallization.”

Chalcogenide glasses are known for their transmittance in the infrared which allows for infrared detection in military applications. However, the glasses are notoriously brittle and as such, extensive studies on expanding their durability are needed. One such alternative is creating a glass ceramic version of the composite. A specific composition was subjected to various heat treatments, which controlled the growth of a secondary crystalline phase. The glasses underwent Vickers hardness measurements as well as Young's modulus to determine whether the induced crystals resulted in a more durable version. In addition, the transmittance was measured to ensure the glasses still had good transparency in the infrared.

Session B: Social Sciences

McDermott, Aaron (2021) Faculty Sponsor, Alissa Boguslaw. **“Where is all the Kohawk Spirit? Solidarity and Collective Identity at Coe College.”**

School spirit does not seem to be prevalent at Coe College. By defining the meanings behind Kohawk identity, school spirit appears in Coe’s subgroups such as clubs and organizations. By analyzing symbols of Kohawk identity, being a Kohawk means holding the common goal of education, building community, being involved on campus and valuing the time spent at Coe. These values are held within Coe’s subgroups, creating greater solidarity within them than to the college as a whole. This demonstrates why school spirit is not immediately visible at Coe and prompts further research like comparative studies with other institutions and the role of subgroups in recruitment and retention of Coe students.

Oleson, Josiah B (2020) Faculty Sponsor, Lisa Barnett. **“Relationship Between Political Persuasion, Online News Sources and Law Enforcement Perceptions.”**

In this project Oleson researched the relationship between political ideology, online news sources and perceptions of law enforcement. While a great body of research exists surrounding perceptions of law enforcement, there is currently a lack of research concerning the impact that online news sources may have on perceptions of law enforcement. The participants of the study were college students, allowing this study to also give insight into the perceptions of law enforcement by young people. In this presentation, Oleson will present the results of this study and discuss how the results should be interpreted in the larger body of work on law enforcement perceptions.

Yoshida, Kei (2020), Luzan JadKarim (2020) Faculty Sponsor, Benjamin Chihak. **“Perceptual-motor Recalibration in Naturalistic and Virtual Environments.”**

The perception-action loop is a concept that explains how people interact with the physical world via existing schemes, which are used to make predictions, take actions and adjust actions based on the feedback. Yoshida and JadKarim studied perception-action coupling in the context of rotational recalibration in naturalistic and virtual environments. Their study explored 1) the mechanisms coupling perceptions and actions and 2) these couplings within virtual and naturalistic environments. The experimental design consisted of a pre-test, recalibration phase and a post-test. Results indicate there are similar recalibration effects in both environments and that these effects transfer between naturalistic and virtual contexts.

Session C: Fine Arts, Humanities and Study Abroad

Brinkman, Emani (2021) Faculty Sponsor, Meira Kensky. **“Antichrist in the Contemporary World in American Horror Story: Apocalypse.”**

The television show “American Horror Story: Apocalypse” uses the figure of the Antichrist to reflect on contemporary anxieties. Starting with the end, the show then rewinds to present its version of the Antichrist and how he brings Armageddon. “American Horror Story: Apocalypse” uses a modern Antichrist to present the end of the world through changing the story of his upbringing, his method of starting the apocalypse and his ultimate death, while keeping the apocalyptic tradition (represented by Hildegard of Bingen and Joachim de Fiore) of the Antichrist’s predetermined plan, the rise of a second Antichrist and the complexity of the Antichrist not fully knowing his own part in his predetermined plan.

Chavez, Carmen Christine (2021) Faculty Sponsor, Emily Ganfield. **“An Audition for the Kennedy Center American College Theatre Festival's Irene Ryan Acting Competition.”**

Introduction: The following monologues were Chavez’s audition pieces for the KCACTF Region 5 Irene Ryan Acting Competition, held in Sioux Falls, South Dakota, in January 2020.

- “Shadow of a Man” by Cherríe Moraga: This monologue is given by Lupe, a 12-year-old Chicana girl. She describes being left alone in a canyon by her brother and the freedom she felt there.
- “Julius Caesar” by William Shakespeare: This monologue is given by Portia, the wife of Brutus. She suspects her husband is keeping things from her and employs him to share his burdens with her.

Gatua, Wanjiku (2020) Faculty Sponsor, John Chaimov. **“Time in Castellón de la Plana, Spain.”**

Gatua spent the fall term of 2019 in Castellón de la Plana, Spain, studying at Universitat Jaume I. During that time Gatua was able to travel the country, grow close to a Spanish host family and learn more about the history and culture of Spain. This presentation is a collection of photos from her time abroad.

McNair, Jazmyne “Jazzie” (2021) Faculty Sponsor, William Carson. “NYC ESCAPE.”

“NYC ESCAPE” is an EP released by Jazzie, focusing on feelings of isolation and fear while spending the semester in a hostel off Broadway. While spending time in New York, Jazzie connected with family and learned about her mother's upbringing. Much of her time outside of absorbing the arts scene was spent in Queens with her grandmother, the energy of which is captured in “GQUATER.” There was a feeling of suspicion and fear in the city as the spread of COVID-19 rose and eventually cut the trip short. Through sampling and documenting different experiences, the album reflects a search for Jazzie’s family, for truth and positivity despite the obstacles.

NYC ESCAPE [This student musical production contains explicit language.]

Track List

1. Hustle
2. iridium
3. Headwraps and Bonnets
4. GQUATER
5. PRIDE!



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